

ANNUAL REPORT FOR 2002



Little Sugar Creek Mitigation Site

Mecklenburg County

Project No. 8.U670122

TIP No. R-211 DA



Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
December 2002

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Summary

The Little Sugar Creek Mitigation Site, located in Mecklenburg County, is in its sixth year of monitoring. Approximately 21 acres in size, the site was to serve as mitigation for the R-211DA section of the Charlotte Outer Loop. The site was originally constructed in the winter of 1996-97. The site must demonstrate success, in regards to hydrology and vegetation for a minimum of three years. The Little Sugar Creek site is monitored for both wetland hydrology and vegetation survival.

Prior to 2002 growing season, the Department made an adjustment to the emergency spillways at all locations on-site. The elevation of each emergency spillway was raised to match the elevation of the flood control structures at both locations on-site. Riprap was then replaced.

The daily rainfall data depicted on the gauge data graphs is recorded from an on-site rain gauge. Additional Charlotte rainfall data used for the 30-70 graph was provided by the NC State Climate Office. In 2002, Charlotte experienced a dry early growing season, which is the most critical part of the year to meet hydrologic success criteria for this site.

Vegetation survival rates at the site are above the minimum success criteria. The average tree density for bottomland hardwood species is 623 trees per acre after five years. Planted shrub species were observed at a density of 340 trees per acre. Herbaceous plantings are also becoming very well established in the bottom and side slopes of the channels.

In addition per the request of the US Army Corps of Engineers, the Department has made a request to The Wetland Restoration Program (WRP) to provide the outstanding mitigation needs for the R-211DA Charlotte Outer Loop. (See Appendix C for letter to WRP.) While the request was made to cover outstanding mitigation needs on the roadway project, the Department intends to explore all options at this mitigation site, in an effort to make as much of the site a success as possible. To date, the Department has received no written response from WRP regarding this request.

Introduction

1.1 PROJECT DESCRIPTION

The Little Sugar Creek Mitigation Site is located in Mecklenburg County. The site, which encompasses approximately 21 acres, is situated at the intersection of Highway 51 and Leitner Drive (Figure 1). It was designed as mitigation for a portion of the Charlotte Outer Loop project that extends from NC 51 to Rea Road (TIP No. R-211 DA, USACE Action ID 199200013).

The project provides for the restoration/creation of bottomland forest, shrub-scrub wetland, and emergent marsh. The site was originally constructed in the winter 1996-97; NCDOT performed supplemental planting work in 1998. The site is in its first year of hydrologic and vegetation monitoring following the site modification prior to the 2002 growing season.

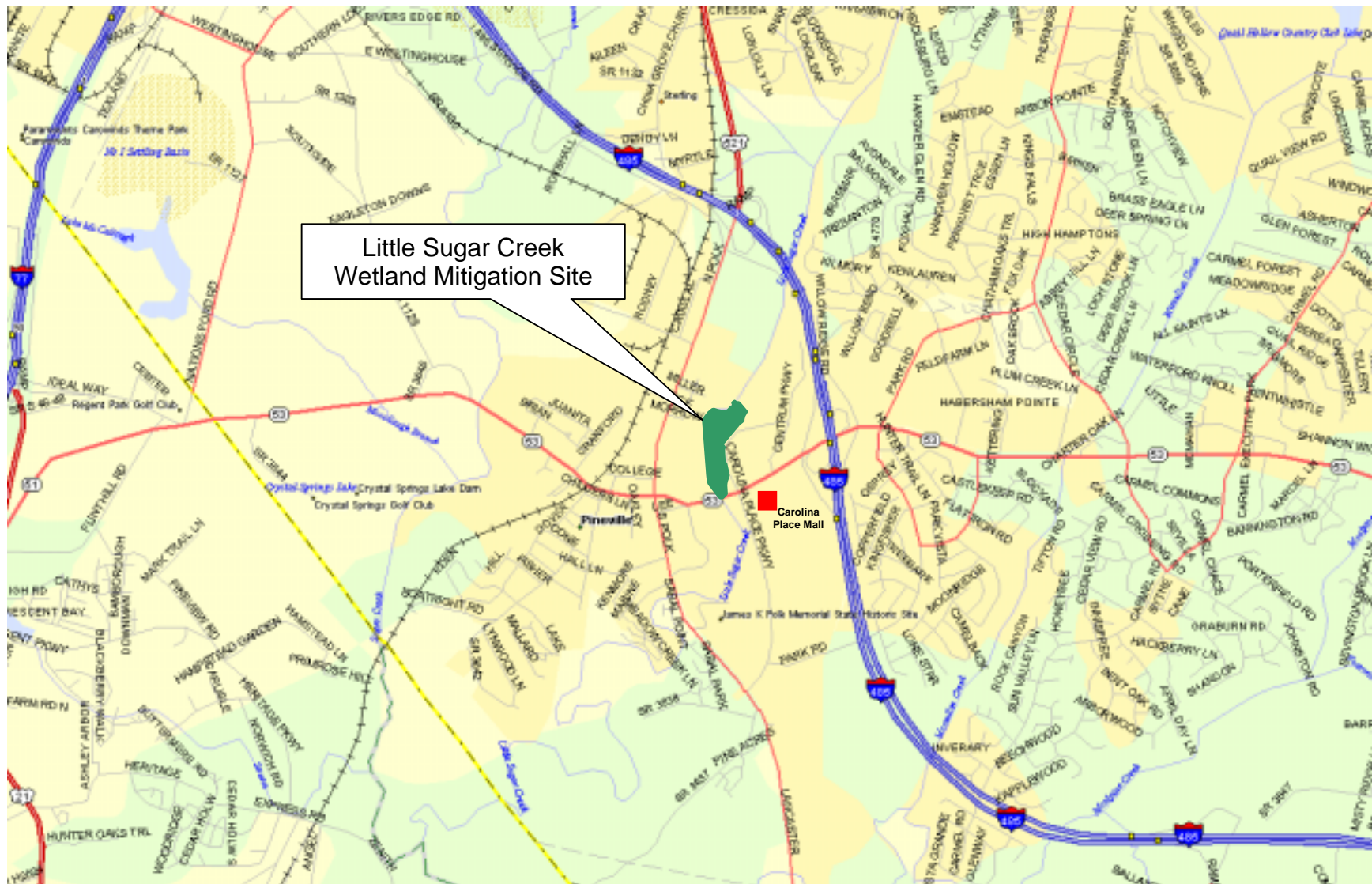
1.2 PURPOSE

In order to demonstrate successful mitigation, Little Sugar Creek is monitored for both hydrology and vegetation. The following report describes the results of the hydrologic and vegetative monitoring during 2002 at the Little Sugar Creek Mitigation Site. Included in this report are the hydrologic and vegetation monitoring results, as well as an analysis of local climate conditions throughout the growing season, and site photographs.

1.3 PROJECT HISTORY

March 1997	Site planted
March-November 1997	Hydrologic Monitoring (1 yr.)
September 1997	Vegetation Monitoring (1 yr.)
March 1998	Shrub Area Replanted
March-November 1998	Hydrologic Monitoring (2 yr.)
September 1998	Vegetation Monitoring (2 yr.)
March-November 1999	Hydrologic Monitoring (3 yr.)
September 1999	Vegetation Monitoring (3 yr.)
March-November 2000	Hydrologic Monitoring (4 yr.)
September 2000	Vegetation Monitoring (4 yr.)
February 2001	Raised weir at sheet piles
March-November 2001	Hydrologic Monitoring (5 yr.)
June 2001	Vegetation Monitoring (5 yr.)
March 2002	Adjusted emergency spillway elevations
March-November 2002	Hydrologic Monitoring (6 yr.)
August 2002	Vegetation Monitoring (6 yr.)

Figure 1. Site Location Map



1.4 DEBIT LEDGER

Table 1. Little Sugar Creek Mitigation Site Debit Ledger

Site Habitat	Mitigation Plan			TIP Debit
	Wetland Acres at Start	Acres Remaining	% Remaining	R-211DA
BLH, Scrub Shrub, FWM	13.1	0	0.00	13.1

BLH: Bottomland Hardwood FWM: Freshwater Marsh

2.0 Hydrology

2.1 SUCCESS CRITERIA

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology states that areas must be inundated or saturated (within 12 inches of the surface) by surface or groundwater for at least a consecutive 12.5% of the growing season. Areas inundated for less than 5% of the growing season are always classified as non-wetlands. Areas inundated between 5% and 12.5% of the growing season can be classified as wetlands depending upon such factors as the presence of wetland vegetation and hydric soils.

The growing season in Mecklenburg County begins March 22 and ends November 11, lasting 235 days. These dates correspond to a 50% probability that air temperatures will not drop below 28F or lower after March 22 and before November 11.¹ Minimum wetland hydrology is required for at least 12.5% of this growing season; for Mecklenburg County, this 12.5% equals 29 consecutive days. Local climate must represent average conditions for the area in order for the hydrologic data to be considered successful.

2.2 HYDROLOGIC DESCRIPTION

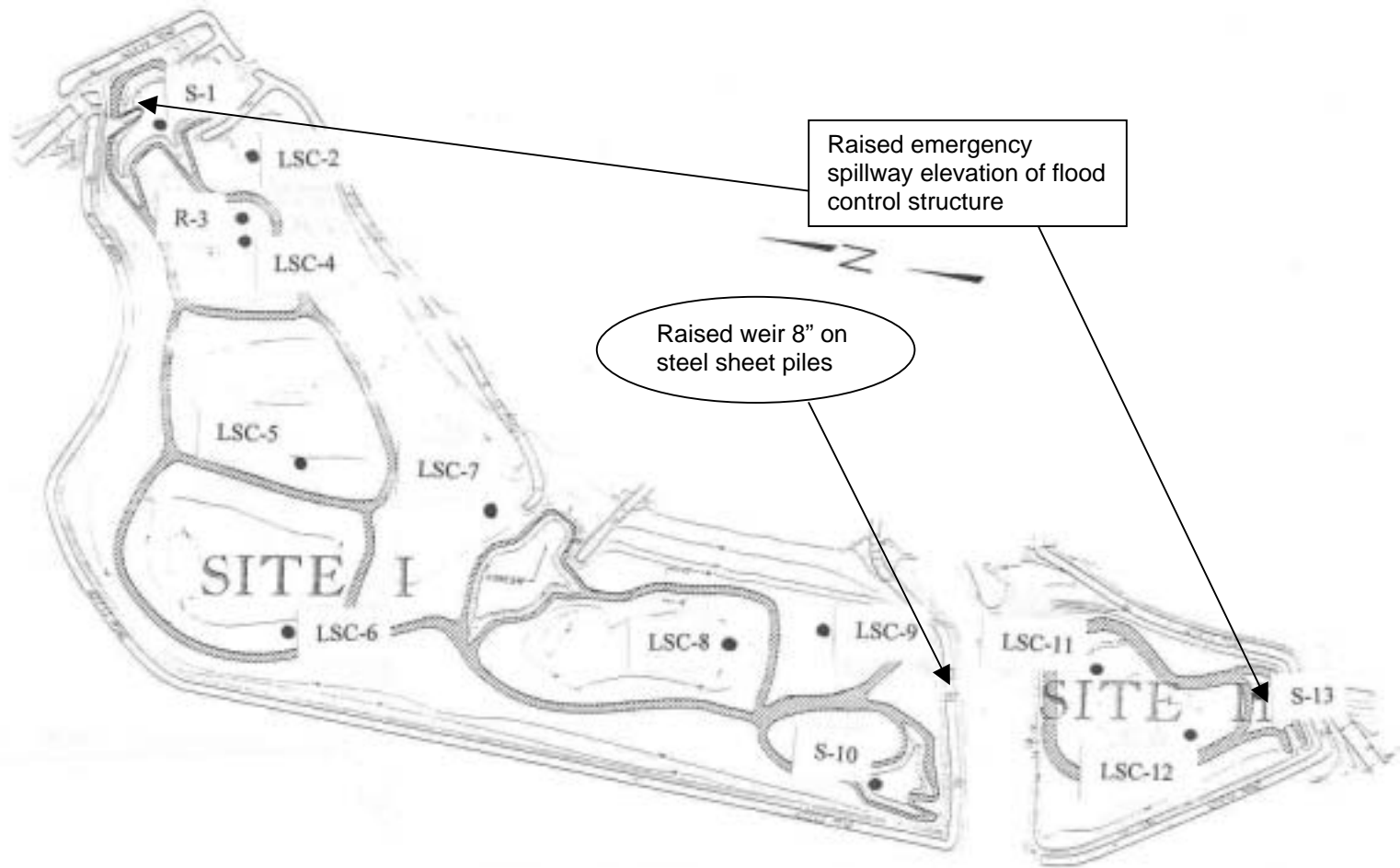
Nine groundwater gauges, one rain gauge, and three 80 inch surface water gauges were installed in 1997 (Figure 2). The automatic monitoring gauges record daily readings of the groundwater depth.

The sluice gates, which were closed in July 1999 to hold surface flow water on the site, remained closed in 2002. In an attempt to further augment the site hydrology, the weir was raised about 8 inches in the ditch where the sheet piles are located and clay was added to the face of the rip-rap at the emergency spillway in 2001. The elevation of both emergency spillway outlets was raised to match the elevation of the flood control structure in March 2002.

Runoff from the surrounding area is the primary hydrologic input to the Little Sugar Creek site. A stormwater pipe, running underneath Leitner Drive, releases water collected from adjacent shopping centers near gauge 9. The monitoring gauges on the site are to show the effects of the stormwater collected in the channels as well as the effects of specific rainfall events on the groundwater table.

¹ Natural Resources Conservation Service, Soil Survey of Mecklenburg County, North Carolina, p.61.

Figure 2. Gauge Location and Site Modification Map



2.3 RESULTS OF HYDROLOGIC MONITORING

2.3.1 Site Data

To determine if the site met the Federal guidelines, saturation within 12 inches of the surface for at least 12.5% of the growing season, the maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 235-day growing season. The results are presented in Table 3.

Appendix A contains a plot of the groundwater and surface water depth for each groundwater and surface gauge, respectively. The individual precipitation events, shown on the monitoring gauge graphs as bars, represent data collected from the on-site rain gauge or from a Charlotte weather station (provided by the NC State Climate Office). If the gauge shows saturation for 5% or greater of the growing season, the maximum number of consecutive days is noted on each graph. The rain gauge on the site was replaced with a more accurate measuring device prior to the beginning of the 2000 monitoring season.

The surface water gauges have indicated consistent surface water in the channels throughout the growing season. Three of the groundwater gauges registered success for a consecutive 12.5% of the growing season, and 2 gauges registered above 8% of the growing season.

Table 2. Hydrologic Monitoring: Little Sugar Creek Mitigation Site
Success Criteria

Monitoring Gauge	< 5%	5-8%	8-12.5%	> 12.5%	Actual %	Dates of Success
LSC-2	✓				5.5	Mar 22 – Apr 14
LSC-4					10.6	Mar 22 – Apr 11
LSC-5		✓			5.1	Mar 22 – Apr 12
LSC-6*				✓	13.6	Mar 30 – Apr 10 Oct 11-Nov 11
LSC-7*			✓		12.3	Mar 30 – Apr 7 Oct 14-Nov 11
LSC-8			✓		12.3	Mar 22 – Apr 18
LSC-9*				✓	13.6	Mar 22 – Apr 14 Oct 11-Nov 11
LSC-11		✓			6.8	Mar 22 – Apr 13
LSC-12*				✓	13.6	Mar 22 – Mar 26 Oct 11-Nov 11

* Gauges met the success criteria during an above average rainfall for the month of October.

Specific gauge problems:

- Gauge 2 did not record data from (January to April 9), due to battery failure.
- Gauge 12 had battery failure 3 times through (May 8-September 5).
- Gauge 2, 4, 5, 8 could not be downloaded due to high water level through (October 10-November 11).

2.3.2 Climatic Data

Figure 3 is a comparison of 2001 and 2002 monthly rainfall to historical precipitation for the area. This comparison indicates if 2002 was below average in terms of climate conditions by comparing the rainfall to that of historical rainfall (data collected between 1971 and 2002). Historic data was provided by the NC State Climate Office.

October was the only month to receive above average rainfall. The months of January, March, May, August, and September all recorded average rainfall for the site. February, April, June, and July experienced below average rainfall. Based on the data collected from the Charlotte weather station, the site received below average rainfall during 2002.

2.4 CONCLUSIONS

The beginning of the growing season is the most critical time for a site; this is when the gauges will most likely meet success due to the recharge of rainfall before the growing season. When the rainfall for these months is below average, then the rain never fully recharges causing saturation levels to decrease.

November and December 2001, February and April 2002 experienced below average rainfall. Along with the dry climatic conditions and several of the gauges experiencing malfunctions, the gauges at Little Sugar experienced difficulty meeting success. Three of the nine gauges showed saturation for 12.5% of the growing season, 2 of the gauges showed between 8 and 12.5% saturation, 2 of the gauges showed between 5 and 8%, and only 1 of the gauges showed less than 5% saturation during the growing season.

Based on the lack of average rainfall for 2002, NCDOT proposes to continue monitoring this site in order to determine the overall effects of the modifications to the site.

Figure 3. Monitoring Gauge Hydrologic Results

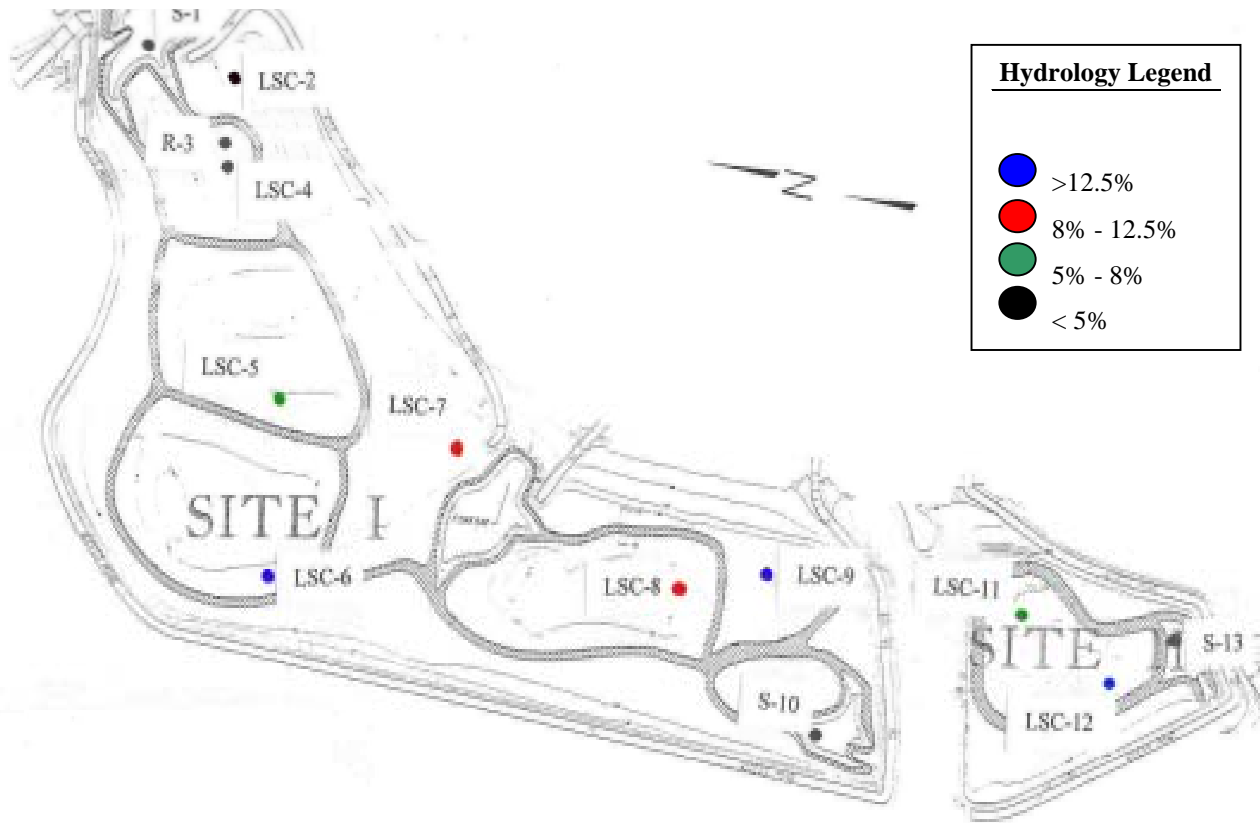
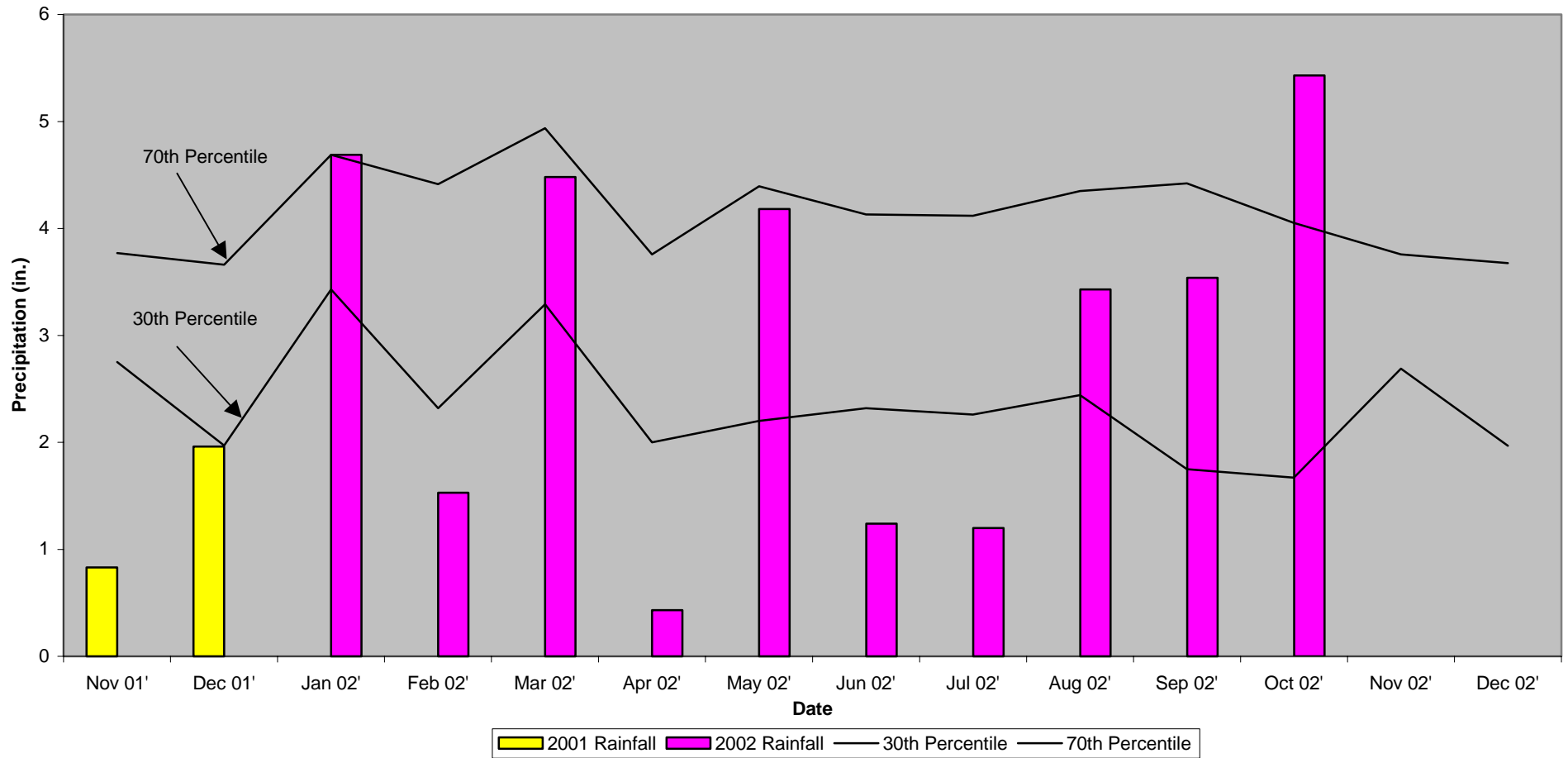


Figure 4.

Little Sugar Creek 30-70 Percentile Graph 2002
Charlotte, NC



3.0 VEGETATION: LITTLE SUGAR CREEK MITIGATION SITE (YEAR 6 MONITORING)

3.1 Success Criteria

Success Criteria states that there must be a minimum mean density of 320 characteristic trees species/acre surviving for at least three years in the bottomland forest area of the site. Characteristic tree species are those species planted along with natural recruitment of sweetgum, red maple, and loblolly pine. Loblolly pine cannot comprise more than 10% of the 320 trees per acre. No quantitative sampling requirements were developed for the herbaceous and shrub assemblages as part of the vegetation success criteria per the August 1995 mitigation plan.

3.2 Description of Species

The following shrub species were re-planted in the Wetland Shrub Restoration Area:

Cornus amomum, Silky Dogwood
Leucothoe axillaris, Dog Hobble
Rhododendron arborescens, Smooth Azalea
Sambucus canadensis, Elderberry
Viburnum nudum, Possum Haw
Aesculus sylvatica, Painted Buckeye
Lindera benzoin, Spicebush

The following herbaceous species were planted in the Channel Areas:

Juncus effusus, Soft Rush
Scirpus validus, Bullrush

The following tree species were planted in the Wetland Restoration Area:

Quercus michauxii, Swamp Chestnut Oak
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus phellos, Willow Oak
Fraxinus pennsylvanica, Green Ash
Betula nigra, River Birch
Quercus lyrata, Overcup Oak
Quercus nigra, Water Oak

3.3 Results of Vegetation Monitoring

Table 3. Vegetation Monitoring Statistics, by plot

Plot # (Type)	Silky Dogwood	Dog Hobble	Painted Buckeye	Green Ash	Water Oak	Cherrybark Oak	Overcup Oak	Swp Chestnut Oak	River Birch	Willow Oak	Total (6 year)	Total (at planting)	Density (Trees/Acre)
1 (Shrub)	15										15	30	340
2 (BLH)				12		1		8	2	5	28	30	635
3 (BLH)				13		2		4	1	7	27	30	612
AVERAGE TREE (BLH) DENSITY													623

Site Notes: Other species noted: wild garlic, *Juncus* sp., Queen-Anne's-lace, various grasses, foxtail, switchgrass, fennel, sycamore, locust, smartweed, volunteer green ash, *Aster* sp., wooly panicum, ragweed, and cottonwood. Elderberry noted in plot 1. Silky dogwood is noted in plot 3. Ditches are full of *Juncus* sp.

3.4 Conclusions

Approximately 9.8 acres of this site was planted in bottomland hardwoods in March 1997. There were two vegetation monitoring plots established in the bottomland hardwood area, Plot #2 and #3. The 2002 vegetation monitoring revealed an average density of 623 trees per acre, well above the 320 tree/acre minimum requirement. Approximately 3.2 acres of this site was planted with shrub species. The 2002 vegetation monitoring of Plot #1 revealed an average density of 340 trees per acre. The remaining 3.7 acres was planted with herbaceous plant material. From visual observation, (see photos) this plant material has become established in the bottom and side slopes of the channels on the site.

NCDOT proposes to discontinue vegetation monitoring at the Little Sugar Creek Mitigation Site.

4.0 Overall Conclusions/Recommendations

In the bottomland hardwood area, the 2002 vegetation monitoring revealed an average density of 623 trees per acre, well above the 320 tree/acre minimum requirement. In the shrub area, the 2001 vegetation monitoring revealed an average density of 340 trees per acre. The herbaceous plant material has become established in the channels throughout the site.

The site modifications made prior to the 2002 growing season appear to have improved the site's hydrologic success. However, the rainfall for 2002 appears to be below average making it difficult to determine if modifications are sufficient.

NCDOT has the following recommendations:

- Continue monitoring the site to determine if the increase in the emergency spillway elevation adjustments were sufficient modification such that the site meets during an average year of rainfall.
- A request has been made to The Wetland Restoration Program (WRP) find additional Bottomland Hardwood Mitigation areas to cover mitigation needs for the R-211DA section of Charlotte outer loop. Once an agreement is in place with WRP, all necessary documentation will be forwarded to the resource agencies.

APPENDIX A

DEPTH TO GROUNDWATER PLOTS

APPENDIX B

SITE PHOTOS

LITTLE SUGAR



Photo 1



Photo 2



Photo 3



Photo 4

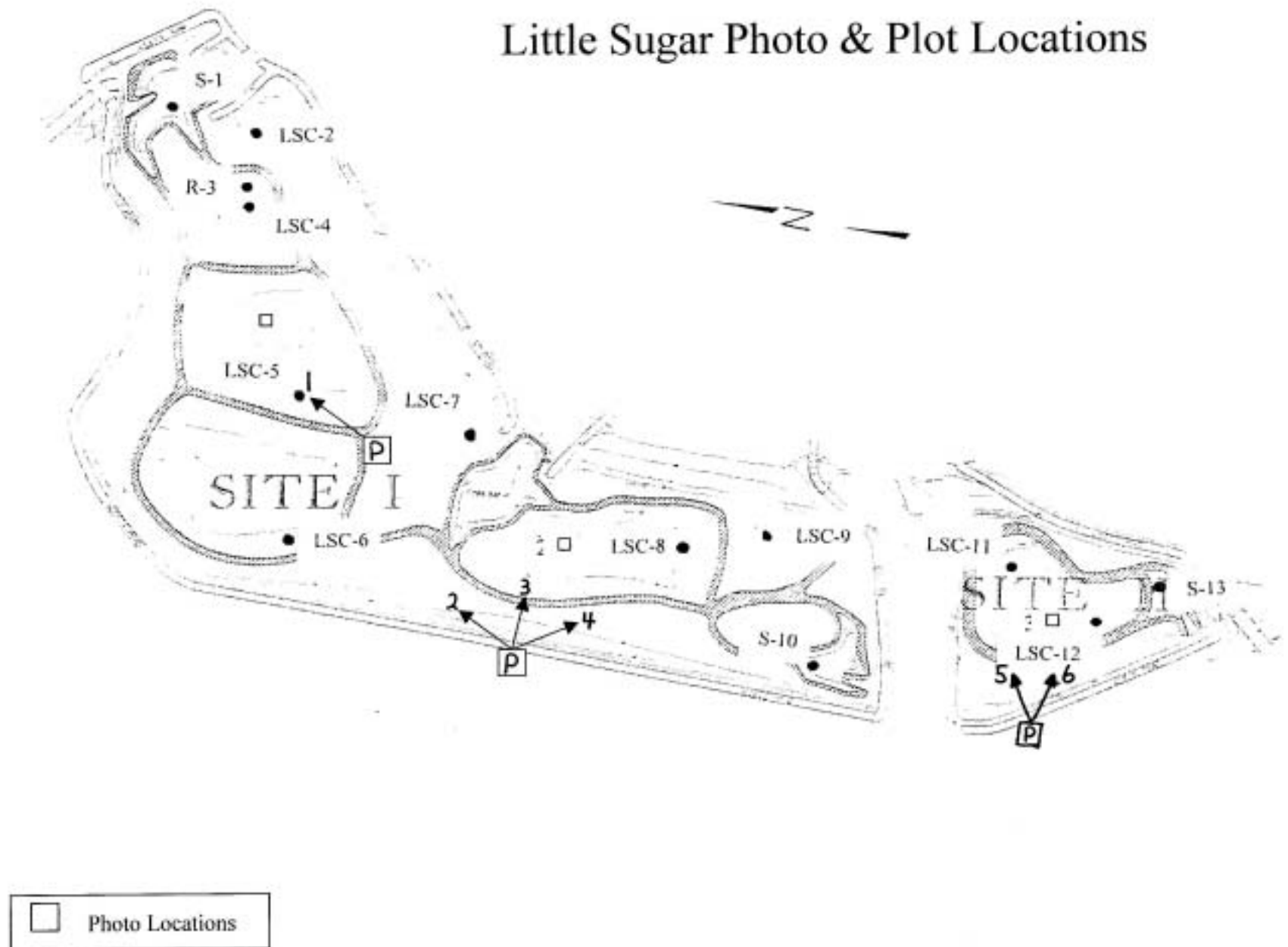


Photo 5



Photo 6

Little Sugar Photo & Plot Locations



APPENDIX C

**LETTER TO N.C. WETLAND RESTORATION PROGRAM,
OCTOBER 8, 2001**



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

MICHAEL F. EASLEY
GOVERNOR

LYNDO TIPPETT
SECRETARY

October 8, 2001

Mr. Ronald E. Ferrell, Program Manager
North Carolina Wetland Restoration Program
NCDENR-DWQ
P.O. Box 29535
Raleigh, NC 27626-0535

Dear Sir:

Subject: REQUEST FOR ACCEPTANCE OF WETLAND MITIGATION for a
completed section of the Charlotte Outer, TIP R-211 DA

At the request of the US Army Corps of Engineers, the North Carolina Department of Transportation (NCDOT) would like to secure outstanding wetland mitigation credits for the above project with the North Carolina Wetlands Restoration Program. The cause for this request is that the one of the sites (Little Sugar Creek) originally secured by NCDOT as mitigation for R-211 DA is not sufficiently meeting hydrologic criteria. The specifics of the request are below.

- Mecklenburg County, Piedmont Province
- Catawba River Basin, Cataloguing Unit: 03050103
- 13.1 acres of restored wetland mitigation is required
- wetland type is non-riparian, bottomland forest

For 13.1 acres at a cost of \$12,000 per acre, NCDOT is proposing to provide payment in the amount of \$157,200 to offset wetland impacts. If you are willing to accept responsibility for compensatory mitigation for this project, please send a letter of confirmation to Mary Frazer at NCDOT, Project Development and Environmental Analysis Branch. If you have any questions or need additional information please call Mary Frazer at (919) 733-1200.

Sincerely,

William D. Gilmore, P.E., Manager
Project Development & Environmental Analysis Branch

cc: Mr. Steve Lund, USACE, Asheville Field Office
Ms. Cynthia Van Der Wiele, NCDENR, Division of Water Quality
Mr. David Franklin, Corps of Engineers, Wilmington Field Office
Mr. N. L. Graf, P.E., FHWA
Mr. John Dorney, NCDENR, Division of Water Quality
Mr. Benton G. Payne, P.E., Division 10 Engineer

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